

Commonwealth Edison Company
Dresden Generating Station
6500 North Dresden Road
Morris, IL 60450
Tel 815/942-2920

ComEd

March 31, 1999

PSLTR: #99-0026

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Dresden Nuclear Power Station Units 1, 2, and 3
Facility Operating Licenses DPR-2, DPR-19, and DPR-25
NRC Dockets 50-10, 50-237 and 50-249

Subject: Dresden Nuclear Power Station 1998 Radioactive Effluent Release Report

Reference: Letter from R. M. Krich (ComEd) to USNRC, Offsite Dose Calculation
Manual Changes for 1998, dated March 12, 1999

The Radioactive Effluent Release Report for January through December 1998 for
Dresden Nuclear Power Station is submitted in accordance with Section 6.9.A.4 of the
Dresden Technical Specifications and 10CFR 50.36a (a)(2).

The Offsite Dose Calculation Manual (ODCM) was submitted by the reference in
accordance with Dresden Technical Specification Section 6.14.A.3.

Questions concerning this report should be directed to the Regulatory Assurance
Manager, Mr. Dale Ambler, at (815) 942-2920, extension 3800.

Respectfully,



Preston Swafford
Plant Manager
Dresden Nuclear Power Station

Attachment

50034

cc: Regional Administrator - NRC Region III
NRC Senior Resident - Dresden Nuclear Power Station

9904050182 990331
PDR ADOCK 03000010
R PDR

March 31, 1999
U.S. Nuclear Regulatory Commission
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bcc: Senior Vice President and General Counsel
Vice President, Regulatory Services
Regulatory Assurance Manager, Dresden Nuclear Power Station
Regulatory Affairs Manager, Quad Cities Nuclear Power Station
Director Licensing and Compliance, Dresden and Quad Cities Nuclear Power
Stations
Winston and Strawn
ComEd Document Control Desk (Hard Copy)
ComEd Document Control Desk (Electronic Copy)
Dresden Regulatory Assurance, Subject File
Numerical File PSLTR: #99-0026
Dresden Project Manager
Chief, Plant Support Branch 2 (two copies)
American Nuclear Insurers Library
Illinois Department of Nuclear Safety
U.S. Environmental Protection Agency
Teledyne
ODCM Coordinator
Licensing Operations Director
Murray and Trettel, Inc.
Radiation Protection Manager
REMP Coordinator

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through December 1998**

DOCKET NUMBERS: 50-010/50-237/50-249

1. Regulatory Limits

a. For Noble Gases

Dose Rate

- 1) Less than 500 mrem/year to the whole body.
- 2) Less than 3000 mrem/year to the skin.

Dose Gamma Radiation

- 1) Less than or equal to 5 mrad/quarter
- 2) Less than or equal to 10 mrad/year

Beta Radiation

- 1) Less than or equal to 10 mrad/quarter
- 2) Less than or equal to 20 mrad/year

b,c. For Iodine-131, for Iodine-133, and for all radionuclides in particulate form with half-lives greater than 8 days.

Dose Rate

- 1) Less than 1500 mrem/year

Dose

- 1) Less than or equal to 7.5 mrem/quarter to any organ.
- 2) Less than or equal to 15 mrem/year to any organ.

d. For Liquid

- 1) Less than or equal to 3 mrem to the whole body during any calendar quarter.
- 2) Less than or equal to 10 mrem to any organ during any calendar quarter.
- 3) Less than or equal to 6 mrem to the whole body during any calendar year.
- 4) Less than or equal to 20 mrem to any organ during any calendar year.

2. Maximum Permissible Concentration

a., b., c., For fission and activation gases, iodines and particulates with half-lives greater than 8 days, allowable dose rates are calculated by solving equations 10.1 and 10.2 from the Offsite Dose Calculation Manual.

d. For liquid effluents, allowable release limits are calculated by solving equations 10.3 and 10.4 from the Offsite Dose Calculation Manual.

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**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through December 1998**

DOCKET NUMBERS: 50-010/50-237/50-249

3. Average Energy

The average energy of fission and activation gases was calculated for the gaseous effluents released from the site. The average energy is based on the percentage of each fission gas nuclide present and its average energy per disintegration (E in MeV/dis) for gamma and beta emissions separately.

$$\begin{aligned} E_{\text{GAMMA}} &= 4.43\text{E-01 MeV/dis} \\ E_{\text{BETA}} &= 5.16\text{E-01 MeV/dis} \end{aligned}$$

4. Measurements and Approximations of Total Radioactivity

- a. Fission and Activation Gases:
- b. Iodines:
- c. Particulates:

The Chimneys and Reactor Building Vent are continually sampled for iodines and particulates. These samples are pulled weekly and analyzed by gamma isotopic. The particulate filters are composited and sent to a vendor for gross alpha Sr-89/90 and Fe-55 analysis. Noble gas grab samples are pulled and analyzed by gamma isotopic weekly. Tritium samples are pulled and analyzed monthly.

The average flow at the release points is used to calculate the curies released. For the Unit 1 Chimney the design basis flow is used to calculate curies released.

- d. Liquid Effluents

The river discharge tanks are analyzed before discharge by gamma isotopic. A composite representative portion of this sample is saved. This is composited with other discharges that occurred during the sample period. The composite is sent to a vendor for gross alpha, H-3, Fe-55, Sr-89-90 analysis.

The tank volumes and activities are used to calculate the diluted activity released at the discharge point from batch discharges.

- e. Less than the lower limit of detection (< LLD)

Samples are analyzed such that the ODCM LLD requirements are met. When a nuclide is not detected then < LLD is reported.

- f. Equipment out of service

The Unit 2 Service Water Rad Monitor was out of service from March 10, 1998 to April 15, 1998. Unit 2 was in a refuel outage during this period. There was a low flow condition in the Service Water header during this time. After the outage ended there was more flow in the Service Water header, and the monitor was able to work properly. A modification was performed in the 4th quarter of 1998 to correct the low flow problem.

- g. Estimation of Data/Corrections:

The 1997 Effluent Report incorrectly reported the number of curies of H-3 released in abnormal release A.1 for the second half of 1997. The correct value is 1.11E-3 Ci H-3 instead of 1.1103 Ci H-3.

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through June 1998**

DOCKET NUMBERS: 50-010/50-237/50-249

SUMMATION OF ALL GASEOUS RELEASES

**UNITS 1st Quarter 2nd Quarter EST.
TOTAL
ERROR, %**

A. FISSION AND ACTIVATION GASES

1. Total Release	Ci	6.56E+01	5.02E+01	7.31E+00
2. Average Release Rate for Period	μCi/sec	8.44E+00	6.38E+00	
3. Percent of Technical Specification Limit	%	•	•	

B. IODINES

1. Total Iodine-131	Ci	9.62E-04	7.51E-04	2.16E+01
2. Average Release Rate of I-131 for Period	μCi/sec	1.24E-04	9.55E-05	
3. Percent of Technical Specification Limit	%	•	•	
4. Total Iodine-131, Iodine-133 and Iodine-135	Ci	4.39E-02	2.19E-02	

C. PARTICULATES

1. Particulates with half-lives > 8 days	Ci	2.38E-03	3.60E-03	3.41E+01
2. Average Release Rate for Period	μCi/sec	3.06E-04	4.58E-04	
3. Percent of Technical Specification Limit	%	•	•	
4. Gross Alpha Radioactivity	Ci	4.48E-06	2.79E-06	

D. TRITIUM

1. Total Release	Ci	2.14E+00	1.54E+00	7.89E+00
2. Average Release Rate for Period	μCi/sec	2.76E-01	1.96E-01	
3. Percent of Technical Specification Limit	%	•	•	

*The information is contained in the Radiological Impact on Man section of the report. Total airborne release data are provided which include fission and activation gases, iodines, particulates, and tritium.

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
July Through December 1998**

DOCKET NUMBERS: 50-010/50-237/50-249

SUMMATION OF ALL GASEOUS RELEASES

	UNITS	1st Quarter	4th Quarter	EST. TOTAL ERROR, %
A. FISSION AND ACTIVATION GASES				
1. Total Release	CI	5.00E+01	3.68E+01	7.31E+00
2. Average Release Rate for Period	μCi/sec	6.35E+00	4.63E+00	
3. Percent of Technical Specification Limit	%	•	•	
B. IODINES				
1. Total Iodine-131	CI	3.50E-03	5.37E-04	2.16E+01
2. Average Release Rate of I-131 for Period	μCi/sec	4.45E-04	6.76E-05	
3. Percent of Technical Specification Limit	%	•	•	
4. Total Iodine-131, Iodine-133 and Iodine-135	CI	2.22E-02	9.78E-03	
C. PARTICULATES				
1. Particulates with half-lives > 8 days	CI	2.79E-03	1.72E-03	3.41E+01
2. Average Release Rate for Period	μCi/sec	3.55E-04	2.16E-04	
3. Percent of Technical Specification Limit	%	•	•	
4. Gross Alpha Radioactivity	CI	6.35E-06	1.15E-05	
D. TRITIUM				
1. Total Release	CI	9.65E-01	2.91E+00	7.89E+00
2. Average Release Rate for Period	μCi/sec	1.21E-01	3.67E-01	
3. Percent of Technical Specification Limit	%	•	•	

*The information is contained in the Radiological Impact on Man section of the report. Total airborne release data are provided which include fission and activation gases, iodines, particulates, and tritium.

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through December 1998**

**Docket Numbers: 50-010/50-237/50-249
TABLE OF LOWER LIMITS OF DETECTABILITY
FOR AIRBORNE EFFLUENTS**

1. FISSION/ACTIVATION GASES	μCi/ml
Kr-87	1.00E-08
Kr-88	1.00E-08
Xe-133	1.00E-08
Xe-133m	1.00E-08
Xe-135	1.00E-08
Xe-138	1.00E-08
2. IODINES	μCi/ml
I-131	1.00E-12
I-133	1.00E-10
3. PARTICULATES	μCi/ml
Sr-89	1.00E-11
Sr-90	1.00E-11
Mn-54	1.00E-11
Fe-59	1.00E-11
Co-58	1.00E-11
Co-60	1.00E-11
Zn-65	1.00E-11
Mo-99	1.00E-11
Cs-134	1.00E-11
Cs-137	1.00E-11
Ce-141	1.00E-11
Ce-144	1.00E-11
4. OTHER	μCi/ml
H-3	1.00E-08
Gross Alpha	1.00E-11

The above values are the ODCM required LLDs. Actual analyses always met the required LLDs.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through December 1998

D1 MAIN CHIMNEY

GASEOUS EFFLUENTS

DOCKET NUMBERS: 50-010

GROUND LEVEL RELEASES

SEMI-ELEVATED RELEASES

ELEVATED RELEASES

XX

CONTINUOUS MODE

NUCLIDES RELEASED	UNIT	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
FISSION GASES						
Ar-41	C
Kr-85	C
Kr-85m	C
Kr-87	C
Kr-88	C
Xe-133	C
Xe-135	C
Xe-135m	C
Xe-138	C
TOTAL	C
IODINES						
I-131	C
I-132	C
I-133	C
TOTAL	C
PARTICULATES						
Fe-55	C	4.62E-08	.	.	.	4.62E-08
Sr-89	C
Sr-90	C	.	2.03E-08	1.25E-10	.	2.04E-08
Cs-137	C
Mn-54	C	1.73E-08	9.48E-07	4.34E-07	2.97E-07	3.42E-06
Co-58	C
Fe-59	C
Co-60	C	2.28E-08	7.24E-08	3.72E-08	3.23E-08	1.65E-05
Zr-95	C
Mn-99	C
Ru-103	C
Ag-110m	C
Sb-124	C
I-131	C
Cs-134	C
Cs-136	C
Cs-137	C	1.39E-08	1.03E-08	.	5.72E-07	2.99E-06
Ba-140	C
Ce-141	C
Ce-144	C
Zn-65	C
Ba-133	C	.	3.51E-07	3.80E-08	.	3.87E-07
Sb-125	C
Sn-113	C
TOTAL	C	5.45E-08	9.60E-08	4.19E-08	4.10E-06	2.33E-05

*The activity of this nuclide is less than the LLD found on the appropriate table

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through December 1998

D1 MAIN CHIMNEY

GASEOUS EFFLUENTS

DUCKET NUMBERS: 50-010

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GROUND LEVEL RELEASES
SEMI-ELEVATED RELEASES
ELEVATED RELEASES

BATCH MODE

NUCLIDES RELEASED	UNIT	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
FISSION GASES						
Ar-41	C1					
Kr-85	C1					
Kr-85m	C1					
Kr-87	C1					
Kr-88	C1					
Xe-133	C1					
Xe-135	C1					
Xe-135m	C1					
Xe-138	C1					
TOTAL	C1	None	None	None	None	None
IODINES						
I-131	C1					
I-133	C1					
I-135	C1					
TOTAL	C1	None	None	None	None	None
PARTICULATES						
Fe-55	C1					
Sr-90	C1					
Sr-90	C1					
Ce-144	C1					
Mo-99	C1					
Co-58	C1					
Fe-59	C1					
Co-60	C1					
Zn-65	C1					
Mn-56	C1					
Ru-106	C1					
Ag-110m	C1					
Sb-124	C1					
I-131	C1					
Ce-134	C1					
Ce-138	C1					
Ce-144	C1					
Pu-240	C1					
La-140	C1					
Ce-141	C1					
Ce-144	C1					
Zn-65	C1					
Ba-133	C1					
Sb-125	C1					
Sb-125	C1					
TOTAL	C1	None	None	None	None	None

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through December 1998

D2/3 REACTOR BUILDING VENT

GASEOUS EFFLUENTS

DOCKET NUMBERS: 50-237/50-249

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GROUND LEVEL RELEASES
 SEMI-ELEVATED RELEASES
 ELEVATED RELEASES

CONTINUOUS MODE

NUCLIDES RELEASED	UNIT	1st QTR	2nd QTR	3rd QTR		TOTAL
FISSION GASES						
Ai-41	CI
Kr-85	CI
Kr-85m	CI
Kr-87	CI
Kr-88	CI
Xe-133	CI	.	.	2.25E+00	.	2.25E+00
Xe-135	CI	1.50E-04	4.53E-05	2.88E-04	1.76E-05	5.01E-04
Xe-135m	CI	4.88E-05	2.70E-06	2.13E-04	.	2.88E-04
Xe-138	CI
TOTAL	CI	2.00E-04	4.80E-05	2.25E+00	1.76E-05	2.25E+00
IODINES						
I-131	CI	8.37E-05	3.89E-05	1.34E-04	1.53E-05	2.72E-04
I-133	CI	1.18E-03	3.23E-04	1.58E-03	1.07E-04	3.17E-03
I-135	CI	7.25E-04	4.99E-04	3.15E-03	7.63E-05	4.45E-03
TOTAL	CI	1.97E-03	8.61E-04	4.67E-03	1.94E-04	7.89E-03
PARTICULATES						
Fe-55	CI	5.37E-04	1.22E-03	2.34E-04	2.80E-04	2.28E-03
Sr-89	CI	1.22E-05	4.28E-06	7.57E-06	3.34E-06	2.74E-05
Sr-90	CI	4.84E-07	1.28E-07	2.05E-07	.	7.97E-07
Cr-51	CI	1.48E-04	7.11E-05	3.91E-04	.	6.10E-04
Mn-54	CI	7.91E-05	1.87E-04	3.80E-05	2.20E-05	3.05E-04
Co-58	CI	9.08E-05	4.14E-05	8.88E-05	.	2.19E-04
Fe-59	CI	.	3.88E-05	.	.	3.88E-05
Co-60	CI	3.34E-04	3.24E-04	1.89E-04	1.14E-04	9.61E-04
Zn-95	CI
Mo-99	CI
Ru-101	CI
Ag-110m	CI
Sb-124	CI
Be-7	CI	.	.	8.50E-06	.	8.50E-06
Ce-134	CI
Ce-136	CI
Ce-137	CI	5.03E-06	1.11E-05	1.98E-06	6.94E-07	1.88E-05
Ba-140	CI	.	2.64E-06	3.79E-04	.	3.82E-04
Ce-141	CI
Ce-144	CI
Sr-85	CI	.	.	1.07E-06	.	1.07E-06
Ba-133	CI
Sb-125	CI
TOTAL	CI	1.21E-03	1.88E-03	1.33E-03	4.30E-04	4.85E-03

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through December 1998

D2/3 REACTOR BUILDING VENT

GASEOUS EFFLUENTS

DOCKET NUMBERS: 50-237/50-249

XX

GROUND LEVEL RELEASES
 SEMI-ELEVATED RELEASES
 ELEVATED RELEASES

BATCH MODE

NUCLIDES RELEASED	UNIT	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
FISSION GASES						
Rn-85	Ci					
Rn-85m	Ci					
Rn-87	Ci					
Rn-88	Ci					
Xe-133	Ci					
Xe-133m	Ci					
Xe-134	Ci					
TOTAL	Ci	None	None	None	None	None
IODINES						
I-131	Ci					
I-133	Ci					
I-135	Ci					
TOTAL	Ci	None	None	None	None	None
PARTICULATES						
Fe-55	Ci					
Sr-89	Ci					
Sr-90	Ci					
Ce-144	Ci					
Co-58	Ci					
Co-59	Ci					
Co-60	Ci					
Zr-95	Ci					
Mo-99	Ci					
Ru-103	Ci					
Ag-110m	Ci					
Sb-124	Ci					
I-131	Ci					
Ce-134	Ci					
Ce-136	Ci					
Ce-137	Ci					
Ba-140	Ci					
La-140	Ci					
Ce-141	Ci					
Ce-144	Ci					
Zn-65	Ci					
Ba-133	Ci					
Sb-125	Ci					
Sb-113	Ci					
TOTAL	Ci	None	None	None	None	None

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through December 1998

D2/3 MAIN CHIMNEY

GASEOUS EFFLUENTS

DOCKET NUMBERS: 50-237/50-249

GROUND LEVEL RELEASES
 SEMI-ELEVATED RELEASES
 ELEVATED RELEASES

XX

CONTINUOUS MODE

NUCLIDES RELEASED	UNIT	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
FUSION GASES						
Ar-41	CI	2 23E-01	1 07E-01	2 30E-01	2 09E-01	7 70E-01
Kr-85	CI				1 03E-03	1 03E-03
Kr-85m	CI	1 64E+00	3 34E+00	3 87E-01	9 21E-01	6 20E+00
Kr-87	CI	2 34E+00	1 01E+00	1 22E+00	1 28E+00	5 02E+00
Kr-88	CI	2 36E+00	6 20E-01	7 71E-01	6 38E-01	4 39E+00
Xe-131	CI	2 13E+00	1 68E-01	1 21E+00	1 59E+00	5 09E+00
Xe-133	CI	2 48E+01	1 32E+01	1 72E+01	5 59E+00	6 08E+01
Xe-135m	CI	5 33E+00	4 33E+00	4 95E+00	7 85E+00	2 25E+01
Xe-138	CI	2 68E+01	2 74E+01	2 17E+01	1 84E+01	9 47E+01
TOTAL	CI	6 56E+01	5 02E+01	4 77E+01	3 60E+01	2 00E+02
KODINE						
I-131	CI	8 78E-04	7 12E-04	3 37E-03	5 22E-04	5 48E-03
I-133	CI	6 27E-03	3 79E-03	5 64E-03	3 87E-03	1 96E-02
I-135	CI	3 48E-02	1 63E-02	8 26E-03	5 19E-03	6 48E-02
TOTAL	CI	4 19E-02	2 10E-02	1 73E-02	8 58E-03	8 98E-02
PARTICULATES						
Fe-55	CI	6 35E-05	1 69E-04	2 24E-05		7 55E-04
Sr-89	CI	6 41E-04	5 22E-04	4 88E-04	5 17E-04	2 17E-03
Sr-90	CI	1 55E-06	1 24E-06		2 58E-06	5 37E-06
Ce-131	CI		1 26E-04			1 26E-04
Mn-54	CI	8 04E-06	4 03E-06			1 21E-05
Co-58	CI					
Fe-59	CI					
Co-60	CI	8 32E-05	7 00E-05	4 92E-05	5 73E-05	2 70E-04
Sr-93	CI					
Mn-99	CI					
Ru-103	CI		1 85E-04			1 85E-04
Ag-110m	CI					
Sb-124	CI					
Sr-85	CI				8 63E-06	8 63E-06
Co-136	CI					
Co-136	CI					
Co-137	CI					
Ba-140	CI	3 50E-04	6 26E-04	6 87E-04	6 73E-04	2 54E-03
Sr-83	CI					
Co-141	CI					
Co-144	CI					
Zn-65	CI					
Ba-133	CI					
Sb-125	CI					
TOTAL	CI	1 16E-03	1 71E-03	1 45E-03	1 78E-03	5 80E-03

*The accuracy of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through December 1998

D2/3 MAIN CHIMNEY

GASEOUS EFFLUENTS

DOCKET NUMBERS: 50-237/50-249

 XX

GROUND LEVEL RELEASES
 SEMI-ELEVATED RELEASES
 ELEVATED RELEASES

BATCH MODE

NUCLIDES RELEASED	UNIT	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
FISSION GASES						
Kr-85	C1					
Kr-85m	C1					
Kr-87	C1					
Kr-88	C1					
Xe-133	C1					
Xe-133m	C1					
Xe-135m	C1					
Xe-138	C1					
TOTAL	C1	None	None	None	None	None
IODINES						
I-131	C1					
I-133	C1					
I-135	C1					
TOTAL	C1	None	None	None	None	None
PARTICULATES						
Fe-55	C1					
Sr-89	C1					
Sr-90	C1					
Ce-137	C1					
Mn-54	C1					
Co-58	C1					
Fe-59	C1					
Co-60	C1					
Zr-95	C1					
Mn-99	C1					
Ru-101	C1					
Ag-110m	C1					
Sb-124	C1					
I-131	C1					
Ce-134	C1					
Ce-136	C1					
Co-137	C1					
Ba-140	C1					
La-140	C1					
Ce-141	C1					
Ce-144	C1					
Zr-143	C1					
Ba-133	C1					
Sb-125	C1					
Sb-113	C1					
TOTAL	C1	None	None	None	None	None

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through December 1998

CHEMICAL CLEANING BUILDING GASEOUS EFFLUENTS

DOCKET NUMBERS: 50-010/50-237/50-249

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GROUND LEVEL RELEASES
 SEMI-ELEVATED RELEASES
 ELEVATED RELEASES

CONTINUOUS MODE

NUCLIDES RELEASED	UNIT	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
IODINES						
I-131	Q
I-133	Q
I-135	Q
TOTAL	Q
PARTICULATES						
Fe-55	Q	.	.	5.99E-07	.	5.99E-07
Sr-89	Q	5.21E-09	3.04E-07	6.49E-08	.	3.74E-07
Sr-90	Q
Cr-51	Q
Mn-54	Q	5.80E-07	9.04E-07	.	1.56E-07	1.64E-06
Co-58	Q
Fe-59	Q	.	3.92E-07	.	.	3.92E-07
Co-60	Q	4.30E-06	2.82E-06	3.23E-06	1.13E-06	1.14E-05
Zr-95	Q
Mn-99	Q
Rn-100	Q
Ag-110m	Q
Sb-124	Q
I-131	Q
Cr-134	Q
Cr-136	Q
Cr-137	Q	1.88E-07	.	1.13E-06	.	1.34E-06
Ba-140	Q	.	.	.	1.56E-07	1.56E-07
Cr-141	Q	.	5.30E-08	1.79E-07	.	2.32E-07
Cr-144	Q
Zn-65	Q
Ba-133	Q
Sb-125	Q
TOTAL	Q	4.97E-06	4.47E-06	5.18E-06	1.46E-06	1.61E-05

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through December 1998

CHEMICAL CLEANING BUILDING GASEOUS EFFLUENTS

DOCKET NUMBERS: 50-010/50-237/50-249

 XX

GROUND LEVEL RELEASES
 SEMI-ELEVATED RELEASES
 ELEVATED RELEASES

BATCH MODE

NUCLIDES RELEASED	UNIT	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
FISSION GASES						
Rn-85	C1					
Rn-85m	C1					
Rn-87	C1					
Rn-88	C1					
Xe-133	C1					
Xe-135	C1					
Xe-135m	C1					
Xe-138	C1					
TOTAL	C1	None	None	None	None	None
IODINES						
I-131	C1					
I-133	C1					
I-135	C1					
TOTAL	C1	None	None	None	None	None
PARTICULATES						
Fe-55	C1					
Mn-55	C1					
Mn-56	C1					
Cr-51	C1					
Mn-54	C1					
Co-58	C1					
Fe-59	C1					
Co-60	C1					
Zr-95	C1					
Mn-56	C1					
Ru-103	C1					
Ag-110m	C1					
Sb-124	C1					
I-131	C1					
Co-134	C1					
Co-136	C1					
Co-137	C1					
Ba-140	C1					
La-140	C1					
Co-141	C1					
Co-144	C1					
Zn-65	C1					
Ba-133	C1					
Sb-125	C1					
La-133	C1					
TOTAL	C1	None	None	None	None	None

*The activity of this nuclide is less than the LLD listed on the appropriate table.

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through December 1998**

Docket Numbers: 50-010/50-237/50-249

**TABLE OF LOWER LIMITS OF DETECTABILITY
FOR LIQUID EFFLUENTS**

1. FISSION/ACTIVATION GASES	μCi/ml
Kr-87	1.00E-05
Kr-88	1.00E-05
Xe-133	1.00E-05
Xe-133m	1.00E-05
Xe-135	1.00E-05
Xe-138	1.00E-05
2. IODINES	μCi/ml
I-131	1.00E-06
3. PARTICULATES	μCi/ml
Fe-55	1.00E-06
Sr-89	5.00E-08
Sr-90	5.00E-08
Mn-54	5.00E-07
Fe-59	5.00E-07
Co-58	5.00E-07
Co-60	5.00E-07
Zn-65	5.00E-07
Mo-99	5.00E-07
Cs-134	5.00E-07
Cs-137	5.00E-07
Ce-141	5.00E-07
Ce-144	5.00E-07
4. OTHER	μCi/ml
H-3	1.00E-05
Gross Alpha	1.00E-07

The above values are the ODCM required LLDs. Actual analyses always met the required LLDs.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through June 1998

RADWASTE LIQUID EFFLUENTS

DOCKET NUMBERS: 50-010/50-237/50-249

**UNITS 1st Quarter 2nd Quarter EST.
TOTAL
ERROR. %**

A. FISSION AND ACTIVATION PRODUCTS

1. Total Release (not including H-3, gases, alpha)	Ci	9.22E-04	1.64E-02	1.06E+01
2. Average Diluted Conc. During Period	µCi/ml	1.89E-09	4.03E-09	
3. Percent of Technical Specification Limit	%	•	•	

B. TRITIUM

1. Total Release	Ci	8.16E+00	2.28E+01	1.14E+01
2. Average Diluted Conc. During Release	µCi/ml	1.67E-05	5.60E-06	
3. Percent of Technical Specification Limit	%	•	•	

C. DISSOLVED AND ENTRAINED GASES

1. Total Release	Ci	1.38E-05	3.15E-04	5.58E+00
2. Average Diluted Conc. During Period	µCi/ml	2.83E-11	7.74E-11	
3. Percent of Technical Specification Limit	%	•	•	

D. GROSS ALPHA ACTIVITY

1. Total Release	Ci	<LLD	<LLD	1.51E+01
------------------	----	------	------	----------

E. VOLUME OF WASTE RELEASED (prior to dilution)	Liters	3.26E+06	1.00E+07	5.00E+00
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D. VOLUME OF DILUTION WATER USED DURING PERIOD	Liters	4.84E+08	4.06E+09	5.00E+00
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*The information is contained in the Radiological Impact on Man section of the report.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 July Through December 1998

RADWASTE LIQUID EFFLUENTS

DOCKET NUMBERS: 50-010/50-237/50-249

UNITS **3rd Quarter** **4th Quarter** **EST.
TOTAL
ERROR. %**

A. FISSION AND ACTIVATION PRODUCTS

1. Total Release (not including H-3, gases, alpha)	Ci	6.72E-03	1.71E-02	1.06E+01
2. Average Diluted Conc. During Period	µCi/ml	4.04E-09	1.59E-08	
3. Percent of Technical Specification Limit	%	•	•	

B. TRITIUM

1. Total Release	Ci	7.12E+00	1.40E+01	1.14E+01
2. Average Diluted Conc. During Release	µCi/ml	4.28E-06	1.30E-05	
3. Percent of Technical Specification Limit	%	•	•	

C. DISSOLVED AND ENTRAINED GASES

1. Total Release	Ci	9.27E-03	2.38E-04	5.58E+00
2. Average Diluted Conc. During Period	µCi/ml	5.57E-11	2.22E-10	
3. Percent of Technical Specification Limit	%	•	•	

D. GROSS ALPHA ACTIVITY

1. Total Release	Ci	<LLD	<LLD	1.51E+01
------------------	----	------	------	----------

E. VOLUME OF WASTE RELEASED (prior to dilution)	Liters	3.76E+06	5.36E+06	5.00E+00
--	--------	----------	----------	----------

D. VOLUME OF DILUTION WATER USED DURING PERIOD	Liters	1.66E+09	1.07E+09	5.00E+00
---	--------	----------	----------	----------

*The information is contained in the Radiological Impact on Man section of the report.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through June 1998

RADWASTE LIQUID EFFLUENTS

DOCKET NUMBERS: 50-010/50-237/50-249

1. Number of Batch Releases: 4.90E+01
2. Total Time for Batch Releases: 1.67E+04 minutes
3. Maximum Time Period for a Batch Release: 3.74E+02 minutes
4. Average Time Period for a Batch Release: 3.40E+02 minutes
5. Minimum Time Period for a Batch Release: 2.82E+02 minutes
6. Average Stream Flow During Periods of Release of Effluent into a Flowing Stream: 2.69E+05 lpm

BATCH MODE					CONTINUOUS MODE		
Unit		1st QTR	2nd QTR		1st QTR	2nd QTR	
Fe-55	Cl	1.48E-04	5.32E-03				
Sr-88	Cl	.	.				
Sr-90	Cl	.	.				
I-131	Cl	.	.				
I-133	Cl	.	.				
As-76	Cl	.	8.38E-05				
Mo-99	Cl	.	3.32E-05				
Tc-99m	Cl	.	3.38E-05				
Cr-51	Cl	8.21E-05	1.19E-03				
Mn-54	Cl	2.43E-04	3.34E-03				
Fe-59	Cl	.	8.20E-04				
Co-58	Cl	.	1.88E-04				
Co-60	Cl	3.98E-04	5.50E-03				
Cs-137	Cl	7.93E-05	5.98E-04				
Zn-65	Cl	.	1.40E-04				
Ru-103	Cl	.	.				
Ag-110m	Cl	.	8.86E-05				
Sb-124	Cl	.	.				
Cs-134	Cl	.	.				
Ba-140	Cl	.	.				
La-140	Cl	.	.				
Ce-141	Cl	.	1.95E-04				
Ce-138	Cl	.	.				
Zr-95	Cl	.	.				
(above)							
Total		9.22E-04	1.84E-02		None	None	
H-3	Cl	8.18E+00	2.28E+01				
Xe-133	Cl	1.38E-05	2.95E-04				
Xe-135	Cl	.	1.90E-05				

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 July Through December 1998

RADWASTE LIQUID EFFLUENTS

DOCKET NUMBERS: 50-010/50-237/50-249

1. Number of Batch Releases: 3.50E+01
2. Total Time for Batch Releases: 8.35E+03 minutes
3. Maximum Time Period for a Batch Release: 5.87E+02 minutes
4. Average Time Period for a Batch Release: 3.36E+02 minutes
5. Minimum Time Period for a Batch Release: 1.33E+02 minutes
6. Average Stream Flow During Periods of Release of Effluent into a Flowing Stream: 2.30E+05 l/min

BATCH MODE				CONTINUOUS MODE			
Unit	3rd QTR	4th QTR		3rd QTR	4th QTR		

Fe-55	Q	2.70E-03	8.30E-03				
Sr-89	Q	.	.				
Sr-90	Q	.	.				
I-131	Q	.	.				
I-133	Q	.	.				
As-76	Q	1.70E-05	1.20E-04				
Mb-99	Q	7.71E-05	6.71E-05				
Tc-99m	Q	7.88E-05	6.82E-05				
Cr-51	Q	4.54E-04	1.48E-03				
Mn-54	Q	1.30E-03	1.63E-03				
Fe-59	Q	3.18E-05	6.64E-05				
Co-58	Q	6.95E-05	7.24E-05				
Co-60	Q	1.84E-03	4.02E-03				
Cs-137	Q	2.14E-04	1.14E-03				
Zn-65	Q	.	6.64E-05				
Ru-103	Q	.	6.77E-05				
Ag-110m	Q	3.65E-05	.				
Sb-124	Q	.	.				
Cs-134	Q	.	.				
Ba-140	Q	.	.				
La-140	Q	.	.				
Cs-141	Q	2.07E-05	1.40E-04				
Cs-138	Q	.	.				
Zr-86	Q	.	.				

(above)

Total		6.72E-03	1.71E-02	None	None		
H-3	Q	7.12E+00	1.40E+01				
Xe-133	Q	6.27E-05	1.68E-04				
Xe-135	Q	4.00E-05	6.90E-05				

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January Through June 1998

CCSW LIQUID EFFLUENTS

DOCKET NUMBER: 50-237/50-249

1. Number of Batch Releases: 1.00E+00
2. Total Time for Batch Releases: 1.24E+00 minutes
3. Maximum Time Period for a Batch Release: 1.24E00 minutes
4. Average Time Period for a Batch Release: 1.24E00 minutes
5. Minimum Time Period for a Batch Release: 1.24E00 minutes
6. Average Stream Flow During Periods of Release of Effluent into a Flowing Stream: 9.46E+04 lpm

			BATCH MODE		CONTINUOUS MODE			
Unit			1st QTR	2nd QTR	1st QTR	2nd QTR		
Fe-55	CI		.	.				
Sr-89	CI		.	.				
Sr-90	CI		.	.				
I-131	CI		.	.				
I-132	CI		.	.				
I-133	CI		.	.				
I-134	CI		.	.				
I-135	CI		.	.				
Cr-51	CI		.	.				
Mn-54	CI		.	.				
Fe-59	CI		.	.				
Co-58	CI		.	.				
Co-60	CI		.	.				
Cs-137	CI		2.46E-06	.				
Zn-65	CI		.	.				
Ru-103	CI		.	.				
Ag-110m	CI		.	.				
Sb-124	CI		.	.				
Cs-134	CI		.	.				
Ba-140	CI		.	.				
La-140	CI		.	.				
Ce-141	CI		.	.				
Cs-138	CI		.	.				
Zr-95	CI		.	.				
(above)								
Total			2.46E-06	.	None	None		
H-3	CI		.	.				
Xe-133	CI		.	.				
Xe-135	CI		.	.				

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 July Through December 1998

CCSW LIQUID EFFLUENTS

DOCKET NUMBERS: 50-237/50-249

1. Number of Batch Releases: 4.00E+00
2. Total Time for Batch Releases: 4.96E+00 min
3. Maximum Time Period for a Batch Release: 1.24E+00 min
4. Average Time Period for a Batch Release: 1.24E+00 min
5. Minimum Time Period for a Batch Release: 1.24E+00 min
6. Average Stream Flow During Periods of Release of Effluent into a Flowing Stream: 9.46E+04 l/min

		BATCH MODE		CONTINUOUS MODE	
Unit		3rd QTR	4th QTR	3rd QTR	4th QTR
Fe-55	CI	.	.		
Sr-89	CI	.	.		
Sr-90	CI	.	.		
I-131	CI	.	.		
I-132	CI	.	.		
I-133	CI	.	.		
I-134	CI	.	.		
I-135	CI	.	.		
Cr-51	CI	.	.		
Mn-54	CI	.	.		
Fe-59	CI	.	.		
Co-58	CI	.	.		
Co-60	CI	.	.		
Cs-137	CI	1.69E-05	.		
Zn-65	CI	.	.		
Ru-103	CI	.	.		
Ag-110m	CI	.	.		
Sb-124	CI	.	.		
Cs-134	CI	.	.		
Ba-140	CI	.	.		
La-140	CI	.	.		
Ce-141	CI	.	.		
Ce-138	CI	.	.		
Zr-95	CI	.	.		
(above)					
Total		1.69E-05	.	None	None
H-3	CI	.	.		
Xe-133	CI	.	.		
Xe-135	CI	.	.		

*The activity of this nuclide is less than the LLD listed on the appropriate table.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January through June 1998

Docket Numbers: 50-237/50-249

UNIT 2&3 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

Est. Total Lbwt. 5

1.	Type of Waste	Unit	6-month period	
a.	Spent resins, filter sludges, evaporator bottoms, etc.	m ³	6.23E+01	25
		Ci	1.62E+02	
b.	Dry compressible waste, contaminated equipment, etc.	m ³	1.21E+03	25
		Ci	1.72E+00	
c.	Irradiated components, control rods, etc.	m ³		
		Ci		
d.	Other (describe)	m ³		
		Ci		

2. Estimate of Major Nuclide Composition (by type of waste)

a. Spent resins, filter sludges, evaporator bottoms, etc.

	<u>Pctwtm %</u>	<u>Curies</u>
Fe-55	4.70E+01	7.63E+01
Co-60	3.80E+01	6.23E+01
Mn-54	1.10E+01	1.82E+01

b. Dry compressible waste, contaminated equipment, etc.

Fe-55	6.50E+01	1.11E+00
Co-60	2.00E+01	3.38E-01
Mn-54	1.00E+01	1.65E-01

c. Irradiated components, control rods, etc.

None.

d. Other

None.

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January through June 1998

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UNIT 2&3 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS (Cont.)

3. Solid Waste Disposition

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
23	Motor Freight (exclusive use only)	CNSI, Barnwell, SC
5	Motor Freight (exclusive use only)	AERC, Oak Ridge, TN
3	Motor Freight (exclusive use only)	Hake, Memphis, TN
6	Train (non-exclusive use)	Hake, Memphis, TN
1	Motor Freight (exclusive use only)	GTS, Oak Ridge, TN

B. IRRADIATED FUEL SHIPMENTS (Disposition)

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
None		

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
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UNIT 2&3 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

In Total Tons, 6

1.	Type of Waste	Unit	6-month period	
a.	Spent resins, filter sludges, evaporator bottoms, etc.	m ³	5.88E+01	25
		Cl	5.21E+03	
b.	Dry compressible waste, contaminated equipment, etc.	m ³	3.03E+02	25
		Cl	6.06E+00	
c.	Irradiated components, control rods, etc.	m ³	3.27E+00	25
		Cl	2.10E+04	
d.	Other: (Describe)	m ³		
		Cl		

2. Estimate of Major Nuclide Composition (by type of waste)

a. Spent resins, filter sludges, evaporator bottoms, etc.

	<u>Percent %</u>	<u>Curies</u>
Co-60	5.60E+01	7.43E+02
Fe-55	2.70E+01	3.56E+02
Mn-54	1.40E+00	1.89E+02

b. Dry compressible waste, contaminated equipment, etc.

Co-60	6.20E+01	3.76E+01
Mn-54	1.80E+01	1.07E+01
Fe-55	1.70E+01	1.01E+01

c. Irradiated components, control rods, etc.

Co-60	4.80E+01	1.00E+04
Fe-55	4.70E+01	9.82E+03
Ni-63	4.00E+00	8.00E+02

d. Other:

None.

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
July Through December 1998**

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UNIT 2&3 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS (Cont.)

3. Solid Waste Disposition

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
22	Motor Freight (exclusive use only)	CNSI, Barnwell, SC
2	Motor Freight (exclusive use only)	AERC, Oak Ridge, TN
2	Motor Freight (exclusive use only)	Hake, Memphis, TN
11	Motor Freight (exclusive use only)	GTS, Oak Ridge, TN

B. IRRADIATED FUEL SHIPMENTS (Disposition)

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
None		

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January through June 1998

Docket Number: 50-10

UNIT 1 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

Est. Total Error: 5

1.	Type of Waste	Unit	6-month period	
a.	Spent resins, filter sludges, evaporator bottoms, etc.	m ³	5.83E+00	25
		Ci	1.56E+01	
b.	Dry compressible waste, contaminated equipment, etc.	m ³	1.79E+02	25
		Ci	6.87E-02	
c.	Irradiated components, control rods, etc.	m ³		
		Ci		
d.	Other (describe)	m ³		
		Ci		

2. Estimate of Major Nuclide Composition (by type of waste)

a. Spent resins, filter sludges, evaporator bottoms, etc.

	<u>Percent %</u>	<u>Curies</u>
Co-60	1.80E+01	2.85E+00
Ni-63	3.40E+01	5.31E+00
Cs-137	4.50E+01	6.96E+00

b. Dry compressible waste, contaminated equipment, etc.

Co-60	2.00E+01	1.37E-02
Ni-63	4.00E+01	2.73E-02
Cs-137	3.80E+01	2.58E-02

c. Irradiated components, control rods, etc.

None.

d. Other

None.

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January through June 1998**

Docket Number: 50-10

UNIT 1 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS (Cont.)

3. Solid Waste Disposition

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
1	Motor Freight (exclusive use only)	CNSI, Barnwell, SC
1	Motor Freight (exclusive use only)	AERC, Oak Ridge, TN
2	Motor Freight (exclusive use only)	Hake, Memphis, TN

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
None		

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 July through December 1998

Docket Number: 50-10

UNIT 1 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

in Table 1

1. Type of Waste	Unit	6-month period	
a. Spent resins, filter sludges, evaporator bottoms, etc.	m ³	5.83E+00	25
	Ci	2.72E+01	
b. Dry compressible waste, contaminated equipment, etc.	m ³	8.60E+02	25
	Ci	8.88E-01	
c. Irradiated components, control rods, etc.	m ³		
	Ci		
d. Other (describe)	m ³		
	Ci		

2. Estimate of Major Nuclide Composition (by type of waste)

a. Spent resins, filter sludges, evaporator bottoms, etc.

	<u>Percent %</u>	<u>Curies</u>
Co-60	1.80E+01	4.96E+00
Ni-63	3.40E+01	9.29E+00
Cs-137	4.50E+01	1.22E+01

b. Dry compressible waste, contaminated equipment, etc.

	<u>Percent %</u>	<u>Curies</u>
Co-60	1.80E+01	1.63E-01
Ni-63	4.20E+01	2.95E-01
Cs-137	3.30E+01	3.77E-01

c. Irradiated components, control rods, etc.

None.

d. Other

None.

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
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Docket Number: 50-10

UNIT 1 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS (Cont.)

3. Solid Waste Disposition

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
8	Motor Freight (exclusive use only)	AERC, Oak Ridge, TN
5	Motor Freight (exclusive use only)	Hake, Memphis, TN
1	Motor Freight (exclusive use only)	CNSI, Barnwell, SC
1	Motor Freight (exclusive use only)	ATG, Richland, WA

B. IRRADIATED FUEL SHIPMENTS (Disposition)

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
None		

DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
 January through December 1998

DOCKET NUMBERS: 50-010/50-237/50-249

ABNORMAL RELEASES *

A. LIQUID

1.	Number of Releases:	3
2.	Total Activity Releases:	<u>6.32E+00 Ci</u>

B. GASEOUS

1.	Number of Releases:	5
2.	Total Activity Releases:	<u>2.30E-02 Ci</u>

A.1 In June, 1994, elevated tritium levels were discovered in the on-site storm sewers. The highest storm drain concentration, 1.34E+04 pCi/l, from the 3rd quarter was used for all of 1998. The total activity released is based on an estimated typical discharge flow of 10 gallons per minute. An estimated 2.66E-02 Ci of H-3 may have been released into the environment. Various storm sewer locations on-site are now periodically analyzed for tritium.

A.2 On March 11, 1998 a contaminated hose was used to drain the U3 A Stator Cooling Heat Exchanger to a floor drain which exhausts through waste water treatment. An estimated 5.00E-01 µCi of Co-60 may have been drained to Waste Water Treatment which discharges into a canal which eventually goes to the Illinois River.

A.3 The monthly service water grab samples are sent offsite for analysis for H-3, Fe-55 and Sr-89/90. The Unit 2 samples for June and July had gross alpha activity above LLD. An estimated 1.29E-01 Ci of gross alpha activity may have been released in Unit 2 Service Water. The Unit 3 samples for February and June had gross alpha activity above LLD. An estimated 1.43E-01 Ci of gross alpha activity may have been released in Unit 3 Service Water. The Unit 3 samples for March, April and September had Fe-55 activity above LLD. An estimated 6.02E+00 Ci of Fe-55 activity may have been released in Unit 3 Service Water.

B.1 In 1997 a leak was discovered for the Unit 3 Main Turbine gland seal system which was allowing steam to enter the U3 Turbine Oil Reservoir. There is an exhaust fan on the reservoir, which exhaust directly into the environment with no monitoring. It is unknown when the leak started. The leak continued through all of 1998. The following activity is estimated to have been released to the environment:

Xe-133	8.56E+03 µCi
Xe-135	7.08E+02 µCi
Xe-138	1.36E+04 µCi

B.2 The heating steam system has low level contamination present. During operation of the system, some steam is vented directly into the environment. Isotopic analysis of the condensate in the system indicates the presence of Co-60, Mn-54 and Cs-137. An estimated 2.39E+00 µCi of Co-60, 3.78E-01 µCi of Mn-54 and 2.55E+00 µCi of Cs-137 may have been exhausted into the environment for all of 1998.

*These releases are not included in the Effluents Summation of all Releases Tables but are included in the Radiological Impact on Man.

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through December 1998**

DOCKET NUMBERS: 50-010/50-237/50-249

- B.3** The ventilation on the U1 Main Turbine Floor (MTF) that went to the D1 Main Chimney is no longer used. The D1 MTF is used for an area to work on contaminated equipment. The calculated release is 36 μCi per year of Cs-137.
- B.4** The Chemistry Hotlab ventilation exhausts directly into the environment without any monitoring. The calculated release to the environment is calculated that $1.91\text{E}+02$ μCi of noble gases and $2.08\text{E}+00$ μCi of iodines/particulates.
- B.5** On April 9, 1998 there was a SCRAM on U3. The isolation condenser was utilized to cooldown the reactor. Due to residual levels of radionuclides present in the isocondser, the following quantities of radionuclides are estimated to have been released into the environment: Co-60 $2.11\text{E}+02$ μCi and for Mn-54 $2.19\text{E}+01$ μCi .

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through December 1998**

RADIOLOGICAL IMPACT ON MAN*

DOCKET NUMBER: 50-010

UNIT 1

1. Airborne Releases

Child Receptor	Percentage of Quarterly Objective					Yearly Obj.	Percentage of Yearly Obj.
	Qtrly Obj.	1st QTR	2nd QTR	3rd QTR	4th Qtr		
Gamma Air	5.0 mrad	0	0	0	0	10.0 mrad	0
Beta Air	10.0 mrad	0	0	0	0	20.0 mrad	0
Total Body	2.5 mrem	0	0	0	0	5.0 mrad	0
Skin	7.5 mrem	0	0	0	0	15.0 mrad	0
Organ	7.5 mrem	0	0	0	0	15.0 mrad	0.01
Critical Organ		Liver	Liver	Liver	Liver		Liver

2. Liquid Releases

Unit 1 liquid wastes are transferred to Units 2 and 3 for processing . There is no direct discharge from Unit 1.

*The doses reported include abnormal releases. These doses are the highest among the four analyzed receptors (infant, child, teenager and adult).

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through December 1998**

RADIOLOGICAL IMPACT ON MAN*

DOCKET NUMBER: 50-237

UNIT 2

1. Airborne Releases

Child Receptor	Percentage of Quarterly Objective					Yearly Obj.	Percentage of Yearly Obj.
	Qtrly Obj.	1st QTR	2nd QTR	3rd QTR	4th Qtr		
Gamma Air	5.0 mrad	0	0	0	0	10.0 mrad	0
Beta Air	10.0 mrad	0	0	0	0	20.0 mrad	0
Total Body	2.5 mrem	0	0	0	0	5.0 mrad	0
Skin	7.5 mrem	0	0	0	0	15.0 mrad	0
Organ	7.5 mrem	0.01	0.02	0.01	0.01	15.0 mrad	0.03
Critical Organ		Lung	Thyroid	Thyroid	Thyroid		Thyroid

2. Liquid Releases

Adult Receptor	Percentage of Quarterly Objective					Yearly Obj.	Percentage of Yearly Obj.
	Qtrly Obj.	1st QTR	2nd QTR	3rd QTR	4th Qtr		
Total Body	1.5 mrem	0.01	0	0	0.01	3.0 mrem	0.02
Organ	5.0 mrem	0	0	0	0.01	10.0 mrem	0.01
Critical Organ		Liver	Liver	Liver	Liver		Liver

*The doses reported include abnormal releases. These doses are the highest among the four analyzed receptors (infant, child, teenager and adult).

**DRESDEN NUCLEAR POWER STATION
UNITS 1, 2 AND 3 RADIOACTIVE EFFLUENT RELEASE REPORT
January Through December 1998**

RADIOLOGICAL IMPACT ON MAN*

DOCKET NUMBER: 50-249

UNIT 3

1. Airborne Releases

Adult Receptor	Percentage of Quarterly Objective					Yearly Obj.	Percentage of Yearly Obj.
	Qtrly Obj.	1st QTR	2nd QTR	3rd QTR	4th Qtr		
Gamma Air	5.0 mrad	0.02	0.02	0.02	0.01	10.0 mrad	0.03
Beta Air	10.0 mrad	0	0	0	0	20.0 mrad	0
Total Body	2.5 mrem	0.03	0.03	0.02	0.02	5.0 mrad	0.05
Skin	7.5 mrem	0.01	0.01	0.01	0.01	15.0 mrad	0.02
Organ	7.5 mrem	0.02	0.08	0.15	0.03	15.0 mrad	0.13
Critical Organ		Thyroid	Thyroid	Thyroid	Thyroid		Thyroid

2. Liquid Releases

Adult Receptor	Percentage of Quarterly Objective					Yearly Obj.	Percentage of Yearly Obj.
	Qtrly Obj.	1st QTR	2nd QTR	3rd QTR	4th Qtr		
Total Body	1.5 mrem	0	0.04	0.04	0.01	3.0 mrem	0.05
Organ	5.0 mrem	0	0.07	0.08	0.01	10.0 mrem	0.08
Critical Organ		Bone	Bone	Bone	Liver		Bone

*The doses reported include abnormal releases. These doses are the highest among the four analyzed receptors (infant, child, teenager and adult).

January-March 1990
130-35 ft. DIFFERENTIAL TEMPERATURE

[illegible]

January-March 1968
150-25 (L. CONFIDENTIAL TOWGAJEE

TOT	4.25	7.44	5.73	4.72	4.18	4.94	3.23	4.77	4.52	4.15	5.18	2.73	5.18	4.24	7.73	6.57	100.00	5.16	1.90	2.57	32.22	52.69	4.17	1.22	100.00
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Wind Direction by Stability

N	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NNW	TOTAL	STABILITY CLASSES		
.60	.37	.46	.19	.23	.31	.29	.14	.32	.20	.09	.14	.00	.60	.56	.37	5.14	Extremely Unstable
.09	.05	.05	.14	.09	.23	.09	.25	.09	.05	.28	.09	.00	.14	.32	.14	1.90	Moderately Unstable
.19	.37	.05	.05	.19	.37	.09	.09	.19	.42	.30	.05	.05	.32	.23	.23	2.07	Slightly Unstable
.93	1.57	1.20	1.67	1.70	2.13	.79	1.11	2.31	2.59	1.99	1.11	2.55	3.47	3.19	1.81	32.22	Neutral
2.45	4.06	3.64	2.45	3.00	4.26	1.62	3.15	5.14	4.79	2.27	1.11	2.50	3.66	3.19	3.09	52.69	Slightly Stable
.29	.37	.29	.19	.19	1.06	.42	.19	.14	.23	.46	.23	.29	.25	.23	.14	4.17	Moderately Stable
.00	.05	.09	.05	.00	.37	.00	.05	.32	.00	.09	.00	.00	.00	.00	.00	1.02	Extremely Stable

Wind Direction by Wind Speed

N	NE	E	SE	S	SW	W	NW	WIND	WIND	WIND	WIND	TOTAL	WIND SPEED CLASSES				
.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	(ALL)				
1.16	1.25	.97	.69	.23	.69	.37	.51	1.39	.23	.50	.50	.65	1.39	1.40	10.25	1.0 - 3.5 mph	
1.03	2.22	1.71	2.73	3.38	4.72	1.16	1.25	1.71	1.62	1.94	.93	2.31	1.94	2.73	2.45	36.62	3.6 - 7.5 mph
1.11	2.92	1.34	1.30	3.56	2.55	.60	1.76	2.69	1.11	1.11	.23	1.67	2.92	2.73	1.44	29.23	7.6 - 12.5 mph
.73	1.25	1.76	.00	.42	.97	.97	1.25	1.57	1.94	.23	.74	.56	.46	.00	1.23	15.09	12.6 - 18.5 mph
.20	.00	.20	.00	.00	.20	.19	.00	1.16	1.39	.69	.23	.20	.00	.00	.00	4.26	18.6 - 24.5 mph
.00	.00	.00	.00	.00	.20	.00	.00	.20	.65	.20	.00	.20	.20	.20	.00	.65	> 24.5 mph

RECEIVED JAN 27 1964

RECEIVED DIRECTOR, FBI
JAN 10 1961

[illegible][illegible]

Camel Creek Station
300 ft. WIND SPEED and WIND DIRECTION

January-March 1958
300-35 ft. DIFFERENTIAL TEMPERATURE

WIND DIRECTION CLASSES	WIND DIRECTION CLASSES																STABILITY CLASSES							
	0	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NNW	TOTAL	0	NU	SI	0	SS	MS	ES	TOTAL
03	.11	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.16	.16							
1 NW	.05	.05	.05	.00	.00	.11	.05	.00	.11	.00	.00	.00	.00	.00	.00	.42		.42						
1 SW	.00	.05	.00	.00	.00	.11	.00	.00	.00	.00	.05	.05	.00	.00	.00	.42			.42					
0	.48	2.11	.63	.05	1.05	.48	.69	.58	.79	.93	.28	.32	.75	.42	.42	11.48				11.48				
2 SS	.16	.05	.00	.00	.00	.53	.37	.21	1.38	1.51	.00	.00	.00	.05	.05	3.81					3.81			
4 MS	.06	.00	.00	.00	.00	.25	.25	.00	.00	.00	.00	.00	.00	.00	.00	.11						.11		
ES	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00						.00		
																							.00	16.42
03	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.05	.25							
6 NW	.00	.00	.00	.00	.00	.00	.00	.00	.05	.25	.00	.00	.00	.00	.00	.32		.32						
1 SW	.00	.00	.00	.00	.00	.00	.00	.00	.05	.25	.00	.11	.00	.00	.00	.42			.42					
0	.06	2.73	.16	.00	.25	.16	.42	.00	1.15	2.06	.48	.42	.00	.25	.21	7.88				7.88				
2 SS	.00	.00	.00	.00	.00	.00	.16	.16	.79	.85	.11	.11	.25	.00	.00	2.22					2.22			
4 MS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00						.00		
ES	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00						.00		
																							.00	13.90

TOT 4.18 9.26 4.82 6.46 8.31 5.34 5.33 5.28 9.26 9.37 4.29 3.79 7.25 4.35 6.49 5.61 126.00 1.81 2.28 4.22 62.49 25.51 3.33 .37 126.00

Wind Direction by Stability

0	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NNW	TOTAL	STABILITY CLASSES
.26	.16	.05	.00	.16	.05	.11	.00	.00	.05	.00	.00	.05	.00	.05	1.81	Extremely Unstable
.16	.32	.16	.05	.16	.21	.05	.05	.25	.25	.00	.00	.05	.25	.11	2.28	Moderately Unstable
.25	.05	.16	.16	.16	.25	.16	.16	.37	.37	.21	.25	.11	.32	.37	4.82	Slightly Unstable
2.12	7.89	2.30	4.82	6.56	2.30	1.80	1.85	4.66	5.19	3.87	1.80	5.58	5.23	4.71	62.49	Neutral
1.27	1.64	1.22	1.27	1.81	2.06	2.65	2.43	3.63	3.23	.85	1.43	1.06	.58	1.81	25.51	Slightly Stable
.11	.00	.05	.05	.25	.25	.25	.53	.37	.25	.16	.21	.37	.16	.16	3.33	Moderately Stable
.00	.00	.00	.00	.00	.11	.00	.05	.00	.00	.00	.00	.21	.00	.00	.37	Extremely Stable

Wind Direction by Wind Speed

0	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NNW	TOTAL	WIND SPEED CLASSES
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	CALM
.25	.21	.00	.25	.25	.42	.16	.16	.25	.42	.25	.42	.25	.21	.21	3.81	1.0 - 3.5 mph
.58	.58	1.11	2.17	1.38	.53	.63	.53	1.06	.85	1.81	1.81	1.38	1.27	1.80	17.25	3.5 - 7.5 mph
1.43	1.16	1.11	2.26	2.27	.53	.53	1.48	1.48	1.22	.74	3.81	2.28	1.75	1.53	25.61	7.5 - 12.5 mph
1.11	2.43	.85	1.80	2.75	1.69	1.75	1.85	2.12	1.11	.79	.53	1.59	2.06	1.80	25.25	12.5 - 18.5 mph
.79	2.17	.69	.85	1.85	1.27	1.22	.79	2.28	1.80	.32	.37	.79	.48	.53	15.42	18.5 - 24.5 mph
.00	2.78	.16	.00	.05	.16	.58	.16	2.26	2.49	.58	.63	.25	.25	.21	19.90	> 24.5 mph

April-June 1958
150-25 ft. DIFFERENTIAL THERMISTERS

SPED CLASS	WIND DIRECTION CLASSES																TOTAL	STABILITY CLASSES						
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NNW	TOTAL		CN	MU	CU	N	CS	MS	ES
ET	.00	.30	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00						
NU	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00					
SD	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00				
AH	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			
SS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			
MS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			
ES	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			
ET	.05	.05	.05	.14	.00	.00	.05	.00	.00	.05	.09	.00	.09	.09	.00	.00	.05	.05						
NU	.05	.00	.05	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			
SD	.00	.05	.09	.00	.00	.00	.00	.00	.00	.00	.05	.05	.05	.00	.05	.00	.00	.00	.00	.00	.00			
AH	.09	.42	.28	.14	.19	.05	.09	.05	.09	.00	.19	.05	.05	.14	.19	.11	2.32							
SS	.05	.79	.42	.37	.14	.29	.37	.23	.14	.14	.30	.19	.29	.23	.60	.70	5.53							
MS	.51	.31	.23	.33	.14	.29	.29	.14	.14	.33	.79	.46	.51	.51	.56	.74	6.00							
ES	.05	.19	.00	.09	.23	.05	.09	.14	.42	.33	.37	.19	.37	.37	.20	.23	3.39							
ET	.42	.33	.00	.05	.42	.46	.00	.37	.09	.23	.14	.42	.19	.60	.79	.19	7.06	7.06						
NU	.05	.00	.25	.19	.05	.09	.05	.05	.00	.00	.00	.09	.19	.19	.09	.05	1.12	1.12						
SD	.05	.19	.00	.14	.09	.23	.00	.14	.05	.00	.00	.00	.09	.09	.20	.05	1.39	1.39						
AH	.37	.51	.37	1.12	.74	.46	.46	.19	.33	.19	.23	.60	.74	.74	1.16	.51	0.74	0.74						
SS	1.21	1.21	2.09	2.23	3.23	1.63	1.62	.90	.34	.65	.79	.65	.00	1.49	.51	.93	20.21	20.21						
MS	.05	.19	.14	.00	.29	1.53	.37	.19	.46	.65	.46	.14	.23	.37	.14	.05	5.25	5.25						
ES	.00	.00	.00	.00	.19	.33	.00	.00	.00	.00	.14	.00	.65	.09	.00	.09	.00	.00						
ET	.09	.33	.79	.46	.19	.23																		

April-June 1968
150-25 ft. DIFFERENTIAL TEMPERATURE

1971	4.37	5.48	7.06	6.60	7.53	8.64	5.90	6.13	6.55	5.53	5.67	4.93	6.78	7.02	6.74	5.87	100.00	13.29	1.21	1.15	21.24	42.47	12.36	4.29	100.00
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N	NE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NNW	TOTAL	STABILITY CLASSES	
.56	.79	1.06	1.25	.65	.80	1.53	.70	.51	.46	.73	.80	.51	1.49	1.06	.65	15.29	Extremely Unstable
.69	.90	.23	.28	.14	.14	.13	.09	.23	.14	.14	.46	.37	.37	.23	.09	3.21	Moderately Unstable
.35	.28	.13	.13	.23	.28	.60	.33	.09	.19	.14	.14	.42	.19	.42	.05	3.16	Slightly Unstable
.60	1.44	1.21	1.67	1.63	.93	1.30	1.21	1.47	.70	1.21	1.35	1.72	1.50	1.06	1.35	21.24	Neutral
2.46	2.37	3.21	2.79	4.04	4.18	2.14	3.25	2.51	2.79	1.50	1.30	2.63	2.04	1.39	1.81	43.47	Slightly Stable
.56	.51	.37	.33	.47	1.06	.65	.33	1.30	1.42	1.30	.60	.74	.80	.70	.70	12.36	Moderately Stable
.05	.19	.00	.09	.42	.37	.09	.14	.42	.33	.51	.19	.42	.46	.28	.33	4.28	Extremely Stable

N	NE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	WIND SPEED CLASSES	
.20	.20	.00	.00	.30	.00	.00	.20	.00	.20	.00	.00	.00	.00	.00	.00	.00	2.41	0
1.39	1.01	1.12	1.07	.70	.65	.80	.56	1.39	.90	1.43	.93	1.35	1.35	1.77	2.00	19.33	1.0 - 3.5 mph	
2.14	2.42	1.53	4.32	4.37	4.74	2.73	1.91	1.77	1.72	1.67	1.91	2.37	3.58	2.97	1.96	44.66	3.6 - 7.5 mph	
.84	1.25	2.49	1.21	1.58	2.32	1.96	1.81	1.91	1.30	1.35	1.30	2.56	1.58	1.63	1.21	25.79	7.6 - 12.5 mph	
.00	.00	.33	.00	.28	.93	.37	1.53	.93	1.58	.00	.74	.51	.51	.37	.00	8.97	12.6 - 18.5 mph	
.00	.00	.00	.00	.00	.00	.00	.23	.51	.05	.28	.05	.00	.06	.00	.00	1.12	18.6 - 24.5 mph	
.00	.00	.00	.00	.00	.00	.00	.09	.25	.00	.00	.00	.00	.00	.00	.00	.18	> 24.5 mph	

April-June 1968
 100-35 (L. CONFIDENTIAL) ENCLOSURES

[illegible]

Coled DRESEN STATION
300 FT. WIND SPEED and WIND DIRECTION

April-June 1998
300-35 FT. DIFFERENTIAL TEMPERATURE

SPEED CLASS	WIND DIRECTION CLASSES																STABILITY CLASSES								TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	EU	NU	SE	N	SS	NS	ES	TOTAL	
EU	.00	.10	.14	.30	.05	.10	.00	.00	.00	.00	.05	.00	.00	.05	.14	.00	.70	.70							
1 NU	.09	.09	.00	.05	.00	.00	.00	.00	.10	.00	.00	.14	.05	.14	.14	.00	.00	.00	.00						
9 SW	.09	.00	.00	.00	.00	.00	.00	.00	.05	.23	.10	.09	.20	.09	.05	.25	1.20			1.20					
11	.00	.05	.10	.00	.17	1.20	.10	.17	.01	.05	.23	.23	.01	.10	.14	.09	5.01			5.01					
2 SS	.23	.10	.05	.00	.10	.00	.05	.32	.09	.46	.32	.32	.10	.05	.23	.14	4.10			4.10					
4 NS	.05	.05	.00	.00	.00	.00	.05	.00	.10	.09	.00	.00	.00	.05	.00	.00	.00					.51			
ES	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00						.14		
																								13.41	
EU	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.14	.05	.00	.10								
6 NW	.00	.00	.00	.00	.00	.00	.00	.00	.14	.00	.00	.00	.00	.05	.00	.00	.10								
1 SW	.00	.00	.00	.00	.00	.00	.00	.00	.05	.25	.00	.00	.00	.00	.00	.00	.14			.14					
11	.00	.09	.00	.00	.09	.09	.00	.14	.01	.23	.10	.14	.00	.05	.00	.05	2.07			2.07					
2 SS	.00	.05	.00	.00	.00	.00	.00	.37	.09	.32	.14	.09	.00	.05	.00	.00	1.11			1.11					
4 NS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00					.00			
ES	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00						.00		
																								3.69	

TOT 4.42 7.33 6.77 7.42 6.73 6.64 6.36 7.00 6.27 6.22 5.35 5.39 6.31 7.10 6.36 3.73 100.00 6.13 7.00 7.00 37.74 29.12 19.32 2.07 100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	STABILITY CLASSES
.14	.05	.03	.46	.23	.70	.23	.23	.05	.20	.46	.20	.00	.00	.74	.10	6.13	Extremely Unstable
.23	.20	.01	.00	.10	.20	.41	.41	.74	.23	.14	.03	.01	.00	.00	.10	7.00	Moderately Unstable
.23	.41	.23	.37	.46	.20	.37	.46	.23	.55	.32	.70	.70	.05	.55	.32	7.00	Slightly Unstable
2.07	3.09	1.23	1.46	2.05	2.50	2.03	2.76	2.12	1.71	1.15	1.75	2.76	2.12	2.40	1.57	37.74	Neutral
1.34	1.94	1.03	2.17	2.53	1.66	1.71	2.49	2.07	2.26	1.09	1.71	1.34	1.57	1.47	.97	29.12	Slightly Stable
.32	.03	.01	.20	.37	1.06	1.24	.37	.37	.97	1.11	.41	.70	.97	.46	.37	10.32	Moderately Stable
.09	.14	.14	.09	.00	.00	.37	.20	.09	.23	.20	.23	.14	.32	.14	.14	2.07	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	WIND SPEED CLASSES
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	CALM
.09	.09	.20	.37	.14	.05	.10	.23	.09	.05	.14	.10	.14	.05	.09	.10	2.35	1.0 - 3.5 mph
.00	1.01	1.07	2.35	1.11	1.15	.32	.03	.60	.46	.41	1.20	.97	.97	1.01	.09	15.05	3.6 - 7.5 mph
1.24	2.30	2.21	1.32	2.30	1.20	2.72	2.26	1.52	1.29	1.29	1.09	2.03	2.76	2.06	1.11	32.21	7.6 - 12.5 mph
1.03	2.72	2.44	1.34	2.40	1.09	2.25	1.04	1.09	2.53	2.44	1.41	2.17	2.44	1.66	1.41	32.49	12.6 - 18.5 mph
1.06	1.06	.37	.05	.09	2.17	.20	.09	1.47	1.30	.03	.70	1.01	.60	.69	.20	13.41	18.6 - 24.5 mph
.00	.14	.00	.00	.00	.00	.00	1.15	.69	.60	.32	.23	.00	.20	.20	.05	3.69	> 24.5 mph

July-September 1990
150-25 FL. DIFFERENTIAL TEMPERATURE

[illegible]

July-September 1998
150-25 ft. DIFFERENTIAL THERMISTERS

787 4.44 4.40 5.35 4.22 4.58 9.75 5.21 6.21 8.25 7.42 9.15 6.44 5.71 4.63 7.34 7.97 138.00 17.53 4.72 4.17 14.12 12.25 14.42 7.34 132.00

Wind Direction by Stability

N	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NNW	NW	TOTAL	-STABILITY CLASSES-	
.95	1.00	1.41	1.41	.54	1.77	1.31	.63	1.13	.95	1.13	1.22	.95	.63	1.04	1.41	17.50	Extremely Unstable
.09	.09	.13	.14	.14	.09	.23	.14	.60	.41	.13	.63	.27	.14	.63	.13	4.22	Moderately Unstable
.05	.23	.05	.13	.05	.23	.13	.13	.45	.27	.54	.63	.36	.23	.14	.41	4.17	Slightly Unstable
.27	.54	.91	.77	.54	.95	.41	1.36	1.01	1.22	1.59	1.59	1.22	1.22	1.13	.91	16.32	Neutral
1.59	1.77	2.54	1.54	2.63	1.76	1.54	2.72	2.99	2.36	1.68	.82	1.86	1.13	1.96	1.72	32.05	Slightly Stable
1.27	.58	.73	.79	.59	2.13	1.36	.91	1.36	1.59	2.54	1.27	.53	1.23	1.41	1.36	13.43	Moderately Stable
.23	.14	.05	.09	.14	.82	.13	.27	.13	.77	1.50	.36	.45	.45	1.04	1.89	7.34	Extremely Stable

Wind Direction by Wind Speed

[illegible]

1961 1959 1958

200 ft. WIND SPEED and WIND DIRECTION

July-September 1990

200-25 FL. DIFFERENTIAL TEMPERATURE

NUMBER OF POSITIONS - 726

VALUES ARE PERCENT COORDINATES

[illegible]

Camel BREWERY STATION
300 FT. WIND SPEED and WIND DIRECTION

July-September 1998
300-35 FT. DIFFERENTIAL TEMPERATURE

SPEED CLASS	WIND DIRECTION CLASSES																STABILITY CLASSES								
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	CU	MU	SI	N	SS	MS	ES	TOTAL
CU	.05	.05	.00	.00	.30	.00	.00	.00	.00	.00	.09	.00	.00	.00	.00	.00	.18	.18							
1 MU	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.14		.14						
9 SI	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.05	.05	.00	.05	.00	.18			.18					
N	.00	.05	.30	.00	.05	.00	.00	.00	.00	.18	.18	.05	.05	.00	.00	.00	.54				.54				
2 SS	.00	.00	.00	.00	.00	.00	.00	.09	.09	.45	.27	.00	.05	.00	.05	.27	1.22					1.22			
4 MS	.09	.32	.00	.00	.00	.00	.00	.05	.00	.23	.00	.05	.00	.00	.00	.29	.82						.82		
ES	.00	.05	.00	.00	.00	.00	.00	.00	.05	.05	.00	.05	.00	.00	.00	.09	.27							.27	3.35
CU	.20	.00	.00	.00	.00	.00	.00	.00	.00	.00	.18	.00	.00	.00	.00	.00	.18	.18							
6 MU	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.25		.05						
7 SI	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			.00					
N	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.09	.00	.05	.00	.00	.00	.18				.18				
2 SS	.00	.00	.00	.00	.00	.00	.00	.00	.05	.09	.00	.00	.00	.00	.00	.00	.14					.14			
4 MS	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.05	.00	.00	.00	.00	.09						.09		
ES	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00							.00	.63

TOT 4.05 5.00 6.83 5.94 5.21 6.87 6.89 6.80 7.66 6.71 8.82 8.84 5.62 4.17 5.25 6.12 100.00 8.11 9.29 8.79 23.12 29.24 18.36 3.17 100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
.60	.73	.45	.77	.36	.95	.50	.45	.45	.23	.73	.32	.23	.23	.50	.54	8.11	Extremely Unstable
.73	.41	.36	.41	.36	.54	.60	.41	.73	.59	.63	1.41	.73	.18	.63	.41	9.29	Moderately Unstable
.14	.41	.36	.27	.18	.54	.54	.23	.82	.77	.95	1.31	.45	.50	.50	.63	8.79	Slightly Unstable
.77	1.00	1.59	1.68	1.09	1.50	.77	1.06	2.81	1.18	1.50	1.27	1.50	1.45	1.18	1.81	23.12	Neutral
1.04	1.50	2.22	1.90	2.10	1.83	2.27	1.90	2.18	2.54	2.27	1.41	1.81	1.18	1.63	1.59	29.24	Slightly Stable
1.00	1.50	.82	.59	1.04	.91	2.13	1.31	.45	1.31	1.72	2.31	.91	.54	.54	.77	18.36	Moderately Stable
.50	.27	.23	.32	.00	.00	.00	.14	.23	.09	.05	.82	.00	.09	.09	.36	3.17	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	CALM
.05	.18	.23	.27	.41	.18	.27	.18	.27	.18	.18	.23	.23	.09	.23	.14	3.31	1.0 - 3.5 mph
.73	.63	1.59	1.31	1.59	1.77	1.06	1.54	1.77	1.18	2.13	1.81	1.54	.96	1.41	1.13	24.84	3.6 - 7.5 mph
2.11	2.27	3.11	2.36	2.36	2.13	3.81	4.83	4.00	2.63	2.63	3.31	2.45	2.27	2.09	2.67	44.24	7.6 - 12.5 mph
1.63	2.27	.91	.00	.82	1.99	.95	.91	1.36	1.72	2.45	3.22	1.27	.95	1.45	1.72	23.62	12.6 - 18.5 mph
.14	.45	.00	.00	.05	.00	.00	.14	1.00	.63	.18	.14	.00	.09	.41	3.35		18.6 - 24.5 mph
.00	.00	.00	.00	.00	.00	.00	.00	.05	.23	.23	.00	.00	.00	.00	.05	.63	> 24.5 mph

October-December 1990
150-35 (L. DIFFERENTIAL EQUATIONS)[illegible]

October-December 1998
154-35 FL. DIFFERENTIAL TOPICS

07 1.24 1.01 2.08 2.50 1.00 1.08 1.36 6.35 1.30 11.02 11.03 4.98 11.30 1.07 1.07 6.94 12.30 1.58 2.72 2.77 29.77 01.56 11.41 5.61 120.00

I	ME	NE	E	SE	S	SW	W	WN	NW	W	WN	W	WN	W	WN	TOTAL	STABILITY CLASSES
.36	.09	.09	.05	.18	.14	.14	.14	.05	.00	.05	.09	.54	.36	.95	.45	3.68	Extremely Unstable
.09	.59	.14	.09	.05	.36	.05	.05	.00	.00	.09	.23	.59	.59	.18	.00	2.22	Moderately Unstable
.05	.23	.09	.00	.00	.00	.27	.05	.05	.05	.41	.27	.50	.50	.23	.05	2.77	Slightly Unstable
1.27	.54	.32	1.04	1.59	1.50	.36	.73	1.21	2.90	3.18	2.70	2.96	2.22	2.90	2.54	29.72	Neutral
1.00	.32	1.54	1.27	1.50	2.13	1.72	4.21	5.54	5.40	3.04	.91	5.50	2.06	2.95	2.50	43.56	Slightly Stable
.27	.29	.00	.05	.23	.35	.32	.53	1.54	2.59	1.72	.59	1.24	1.21	1.59	.73	13.43	Moderately Stable
.00	.00	.00	.00	.14	.36	.00	.09	.32	.60	1.54	.59	.18	.32	.77	.64	5.63	Extremely Stable

N	NE	NE	E	E	SE	SE	S	S	SW	SW	W	W	W	W	TOTAL	WIND SPEED CLASSES
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	CALM
.73	.41	.41	.27	.59	.60	.54	.73	1.89	1.32	.91	.54	.68	.62	1.77	1.00	1.0 - 3.5 mph
1.59	1.18	1.27	.91	1.32	2.50	1.94	1.91	2.99	5.08	4.22	1.68	4.90	3.99	3.99	3.68	3.6 - 7.5 mph
.68	.23	.59	1.23	1.72	1.85	1.84	1.95	1.58	2.27	2.59	1.83	4.26	3.36	2.77	1.85	7.6 - 12.5 mph
.00	.00	.41	.89	.85	.85	.68	1.36	1.13	2.13	1.58	.85	1.13	.59	.54	.77	12.6 - 18.5 mph
.85	.00	.00	.00	.00	.00	.25	.36	.58	.68	.77	.85	.32	.00	.90	.05	18.6 - 24.5 mph
.00	.00	.00	.00	.00	.00	.00	.89	.14	.54	.23	.00	.85	.00	.00	1.84	> 24.5 mph

October-December 1959
100-15 ft. GUTTIFEREA VERMICIFORMIS

[illegible]

October-December 1998
300-35 FL. DIFFERENTIAL TOPOLARIES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
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